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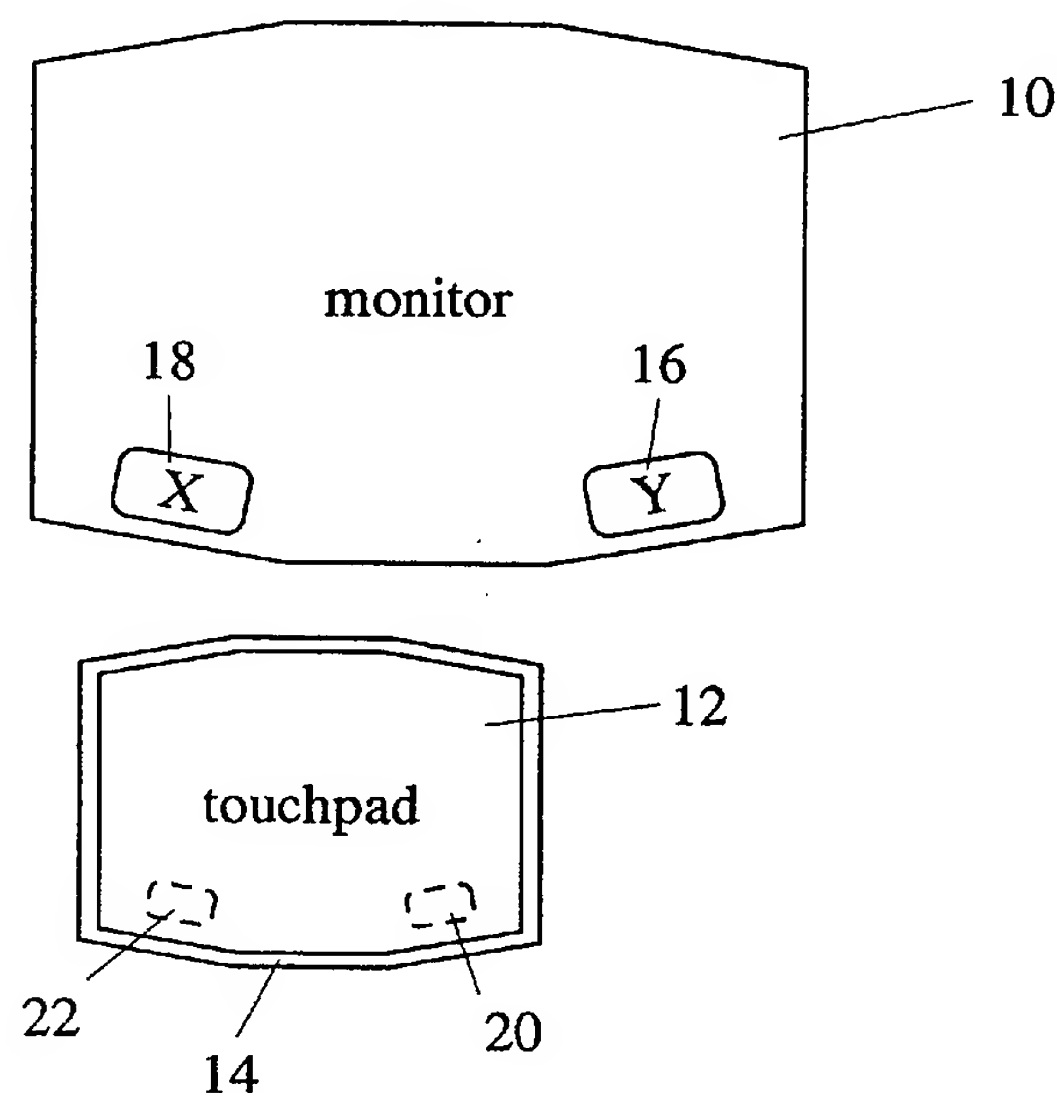
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(54) **Command input system**

(57) The command input system has a display screen and a touch-sensitive input field. On the input field, there is a spatial relationship with control options shown on the display field of the display screen. The

input field conveys tactile feedback about the available and/or executed control actions. The command input system is especially well-suited for use in vehicles since it does not require constant eye contact with the display field.



**Fig. 1a**

## Description

**[0001]** The present invention relates to a command input system with a display screen and a touch-sensitive input field.

**[0002]** Tactile command input systems are known especially from the realm of data processing equipment, particularly in so-called notebooks and laptops, where the touch-sensitive input field is generally referred to as a touchpad. In desktop systems, such a touchpad replaces the commonly employed computer mouse and serves to control the cursor and to trigger control actions. The cursor movements and the control actions are shown on the display field of the display screen. Since a touchpad only has a surface area of a few square centimeters, no spatial relationship exists between, on the one hand, the control options shown on the display field and the cursor movements and, on the other hand, the touch positions on the touchpads. As a result, in spite of the limited surface area of the touchpad, the cursor can be moved over the entire surface area of the display field.

**[0003]** With such command input systems, constant eye contact with the display field is needed in order to specifically select one of the control options shown there. Therefore, such a command input system is only suitable in environments that permit constant eye contact with the display field. Generally speaking, this condition cannot be met, for example, in vehicles, at least not for the control of vehicle features by the driver while driving.

**[0004]** The present invention provides a command input system that, due to tactile feedback about available or executed input functions, does not require constant eye contact with the display field of the display screen. Specifically, the invention provides a command input system with a display screen where command input options are displayed, and a touch-sensitive input field. A spatial correspondence exists between command input options shown on the display screen and the physical surface area on the touch-sensitive input field, as signalled to a user by tactile feedback from the input field. As used herein, "spatial correspondence" means that the display field where available command input options appear on the display screen and the input field are of a generally similar, if not identical, shape, although their sizes may be different (substantially congruent shapes), and commands referred to by command input options appearing at particular locations in the display field, are executed when similar locations are touched on the input field. Preferably, at least the contour of the input field is of a palpable structure such as a raised rim. Also, command input options are easily recognised on the input field by corresponding palpable structures.

**[0005]** Further details of the invention will ensue from the following description of several embodiments with reference to the accompanying drawings. In the drawings:

Figure 1a shows a first embodiment with an input field that is surrounded by an orientation frame;

Figure 1b shows a second embodiment with an input field that is surrounded by an orientation frame;

Figure 2 shows an embodiment in which command input elements can be felt underneath a smooth, but flexibly yielding surface of the input field;

Figure 3 shows different three-dimensional shapes of the input field; and

Figure 4 shows an embodiment in which the input field has a plurality of local actuators situated beneath a flexible tensioned foil.

**[0006]** In the embodiment shown in Figure 1a, a flat display screen 10 has an irregular octagonal shape close to that of a rectangle. A touch-sensitive input field 12, also referred to as a touchpad below, has the same general shape as the display screen, although it is of a smaller size. Input field 12 is surrounded by a palpable, especially raised, continuous rim or frame 14. Frame 14 preferably has a relatively soft feel along its inner periphery and a relatively hard feel along its outer periphery. Near the right-hand and the left-hand lower corners of display screen 10, symbolic "push-buttons" 16, 18 are displayed, labelled "X" and "Y", respectively. Similarly, input field (touchpad) 12 has sensitive locations 20, 22 near its right-hand and left-hand lower corners, as suggested by dotted lines. When input field 12 is touched at location 20 or 22, a command is generated which is associated with "push-button" 16 or 18 appearing on display screen 10.

**[0007]** The Fig. 1b embodiment is generally similar, but has an irregular n-cornered shape (11 corners, actually). It also has a pair of "push-button" symbols 16b, 18b on the display screen 10b and corresponding sensitive locations 20b, 22b on input field 12b.

**[0008]** It should be understood that in both embodiments, the number, shape and distribution of symbols on the display field of the display screen and of corresponding sensitive locations on the input field may vary according to intended use.

**[0009]** In the embodiment shown in Figure 2, the input field (touchpad) 30 has a flexibly yielding tensioned foil 32 with a generally smooth outer surface. Beneath foil 32, a plurality of palpable command input structures 34 are situated. These structures 34 are associated with corresponding command input options shown on the display field of the display screen.

**[0010]** In the embodiment shown in Figure 3, the input field or touchpad generally has a structured three-dimensional surface wherein palpable structures are associated with corresponding command input options shown on the display field. The palpable structures can be of various kinds. Especially suitable types are raised, flat

shaped elements, indented flat shaped elements, bulges, geometric shaped elements such as circles, rectangles, triangles, roughened surfaces, smooth surfaces, palpable hard/soft material transitions and palpable rigid/flexible material transitions.

**[0011]** In the embodiment shown in Figure 4, actuators 40 are situated at specific locations beneath a flexible surface of the input field or touchpad 42. The actuators 40 are associated with command input options shown on the display field. These actuators 40 generate palpable, tactile feedback about the executed command actions or available command input options, corresponding to the contents on the display screen. The actuators can be made on the basis of different technologies, including electromechanic, electromagnetic, piezoelectric, pneumatic or hydraulic.

### Claims

1. A command input system with a display screen where command input options are displayed and a touch-sensitive input field, **characterized in that** a spatial correspondence exists between command input options shown on the display screen and the physical surface area on the touch-sensitive input field, as signalled to a user by tactile feedback from the input field.

2. The command input system according to Claim 1, wherein the input field has a rim with a contour that palpably replicates the display screen.

3. The command input system according to Claim 2, wherein the rim is raised relative to the input field.

4. The command input system according to Claim 2 or 3, wherein the rim continuously surrounds the input field.

5. The command input system according to Claim 1, wherein the input field has palpable structures that are associated with the command input options shown on the display screen.

6. The command input system according to Claim 5, wherein the palpable structures are covered by a tensioned flexible foil that has a smooth surface on its side opposite to the palpable structures.

7. The command input system according to Claim 5, wherein the palpable structures comprise at least one of the following elements:

- raised, flat shaped elements,
- indented flat shaped elements,
- bulges,
- geometric shaped elements such as circles,

- rectangles, triangles,
- roughened surfaces,
- smooth surfaces,
- palpable hard/soft material transitions
- palpable rigid/flexible material transitions.

8. The command input system according to Claim 1, wherein the input field has a flexibly yielding, smooth surface beneath which a plurality of actuators are situated that generate a palpable reaction in response to an executed command input or to an available command input option.

9. The command input system according to Claim 8, wherein the actuators are selected from among the following types:

- electromechanical,
- electromagnetic,
- piezoelectric,
- pneumatic
- hydraulic.

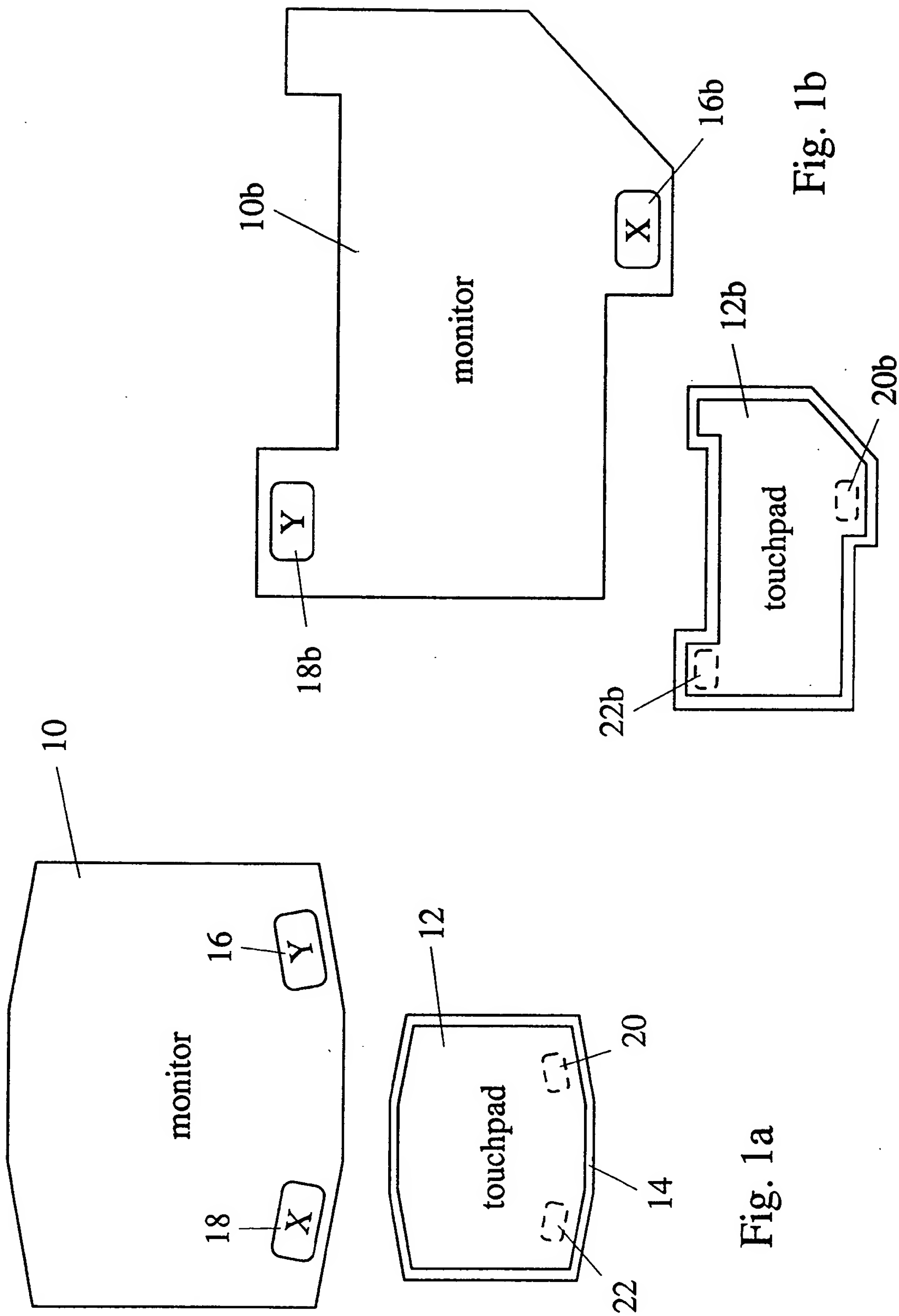


Fig. 1b

Fig. 1a

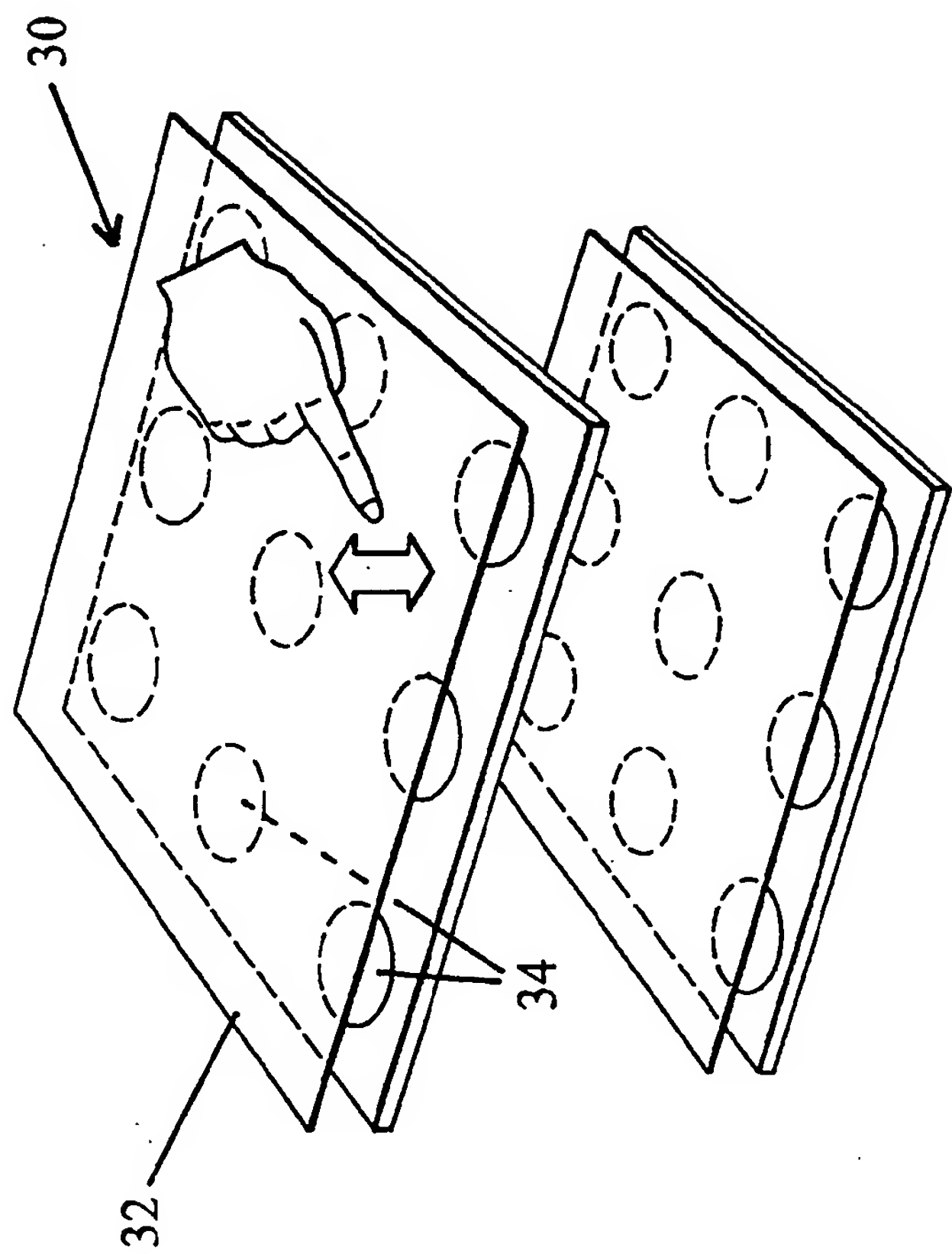
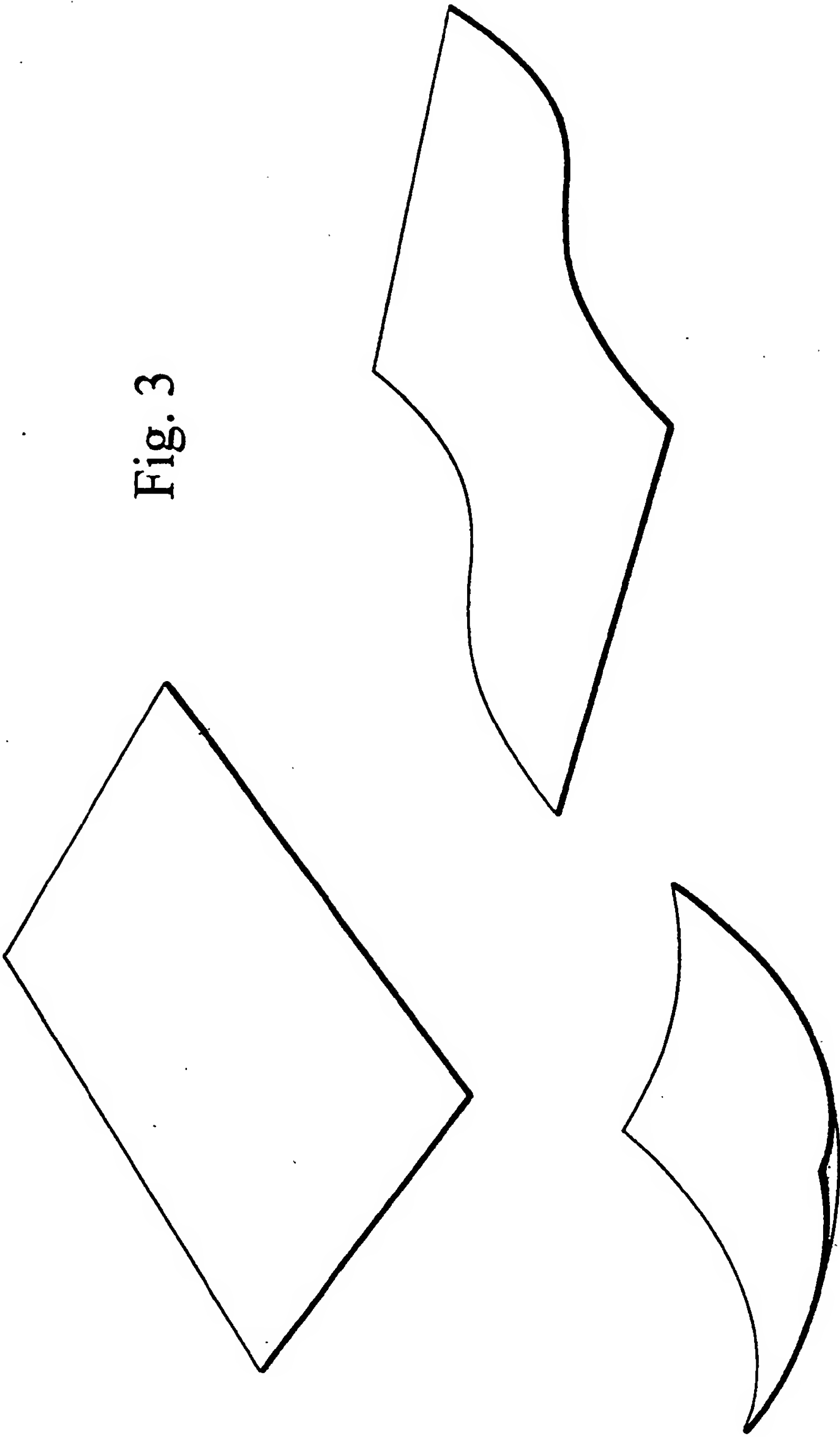


Fig. 2

Fig. 3



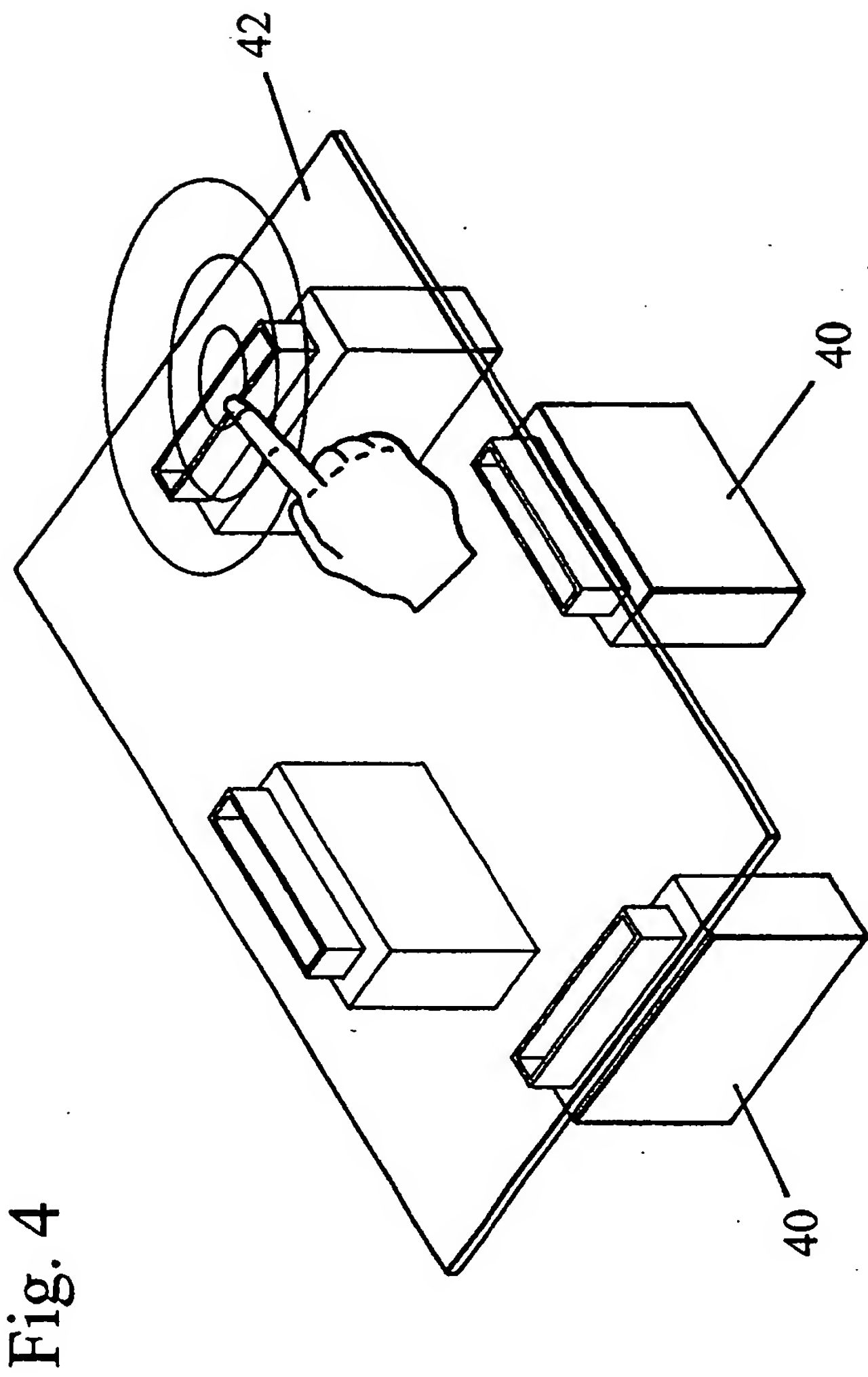


Fig. 4

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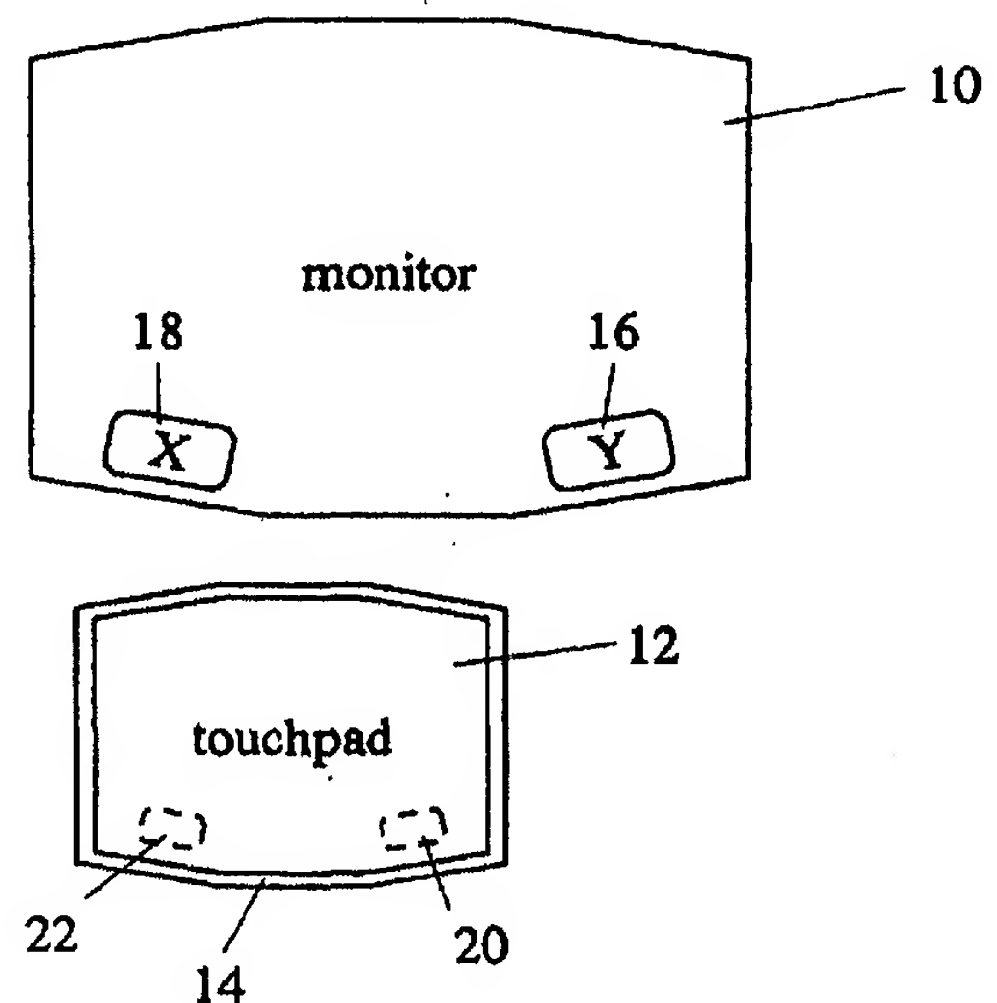
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**Fig. 1a**

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## EUROPEAN SEARCH REPORT

Application Number  
EP 02 01 9878

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	"TOUCH SENSITIVE OVERLAY WITH TACTILE FEEDBACK" IBM TECHNICAL DISCLOSURE BULLETIN, IBM CORP. NEW YORK, US, vol. 29, no. 2, July 1986 (1986-07), pages 761-763, XP002125446 ISSN: 0018-8689 Whole Document	1	G06F3/033 H01H13/70 G06F3/00
X	EP 1 014 295 A (TOKAI RIKI CO LTD) 28 June 2000 (2000-06-28) * page 2, column 1, line 5 - page 2, column 1, line 11 * * page 2, column 2, line 3 - page 2, column 2, line 19 * * page 3, column 3, line 4 - page 3, column 3, line 15 * * page 5, column 8, line 41 - page 5, column 8, line 53 * * page 6, column 9, line 2 - page 6, column 9, line 25 * * figures 3-22 *	1-7	
X	WO 01/54109 A (IMMERSSION CORP) 26 July 2001 (2001-07-26) * abstract * * page 5, line 29 - page 6, line 40 * * page 9, line 15 - page 10, line 20 * * page 12, line 37 - page 15, line 11 * * page 17, line 5 - line 32 * * page 18, line 34 - page 19, line 2 * * figures 1,3-7 *	1,8,9	G06F H01H B41J
A	WO 97/18546 A (CIRQUE CORP) 22 May 1997 (1997-05-22) * page 14, line 28 - page 14, line 34 * * figures 4A,4B *	2-4	
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 8 April 2004	Examiner Butler, M
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)



European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 02 01 9878

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 598 527 A (DEBRUS MARIE-HELENE ET AL) 28 January 1997 (1997-01-28) * page 6, column 4, line 58 - page 6, column 4, line 61 * * figure 2 *	1,5-7	
A	US 5 717 423 A (PARKER DAVID N) 10 February 1998 (1998-02-10) * column 6, line 40 - column 7, line 29 * * column 9, line 8 - column 10, line 42 * * column 11, line 61 - column 12, line 15 * * figures 1-18 *	1,8,9	
The present search report has been drawn up for all claims.			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
Place of search BERLIN		Date of completion of the search 8 April 2004	Examiner Butler, M
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03-82 (P04C01)



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Application Number

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### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

### LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent  
Office

LACK OF UNITY OF INVENTION  
SHEET B

Application Number  
EP 02 01 9878

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-4

Command input system with a display screen displaying input options and a touch-sensitive input field, where a spatial correspondance exists between the displayed input options and the physical surface of the input field, as signalled by tactile feedback,

characterised in that the input field has a rim with a contour that palpably replicates the display screen.

2. Claims: 5-7

Command input system with a display screen displaying input options and a touch-sensitive input field, where a spatial correspondance exists between the displayed input options and the physical surface of the input field, as signalled by tactile feedback,

characterised in that the palpable structures are covered by a tensioned flexible foil.

3. Claims: 8-9

Command input system with a display screen displaying input options and a touch-sensitive input field, where a spatial correspondance exists between the displayed input options and the physical surface of the input field, as signalled by tactile feedback,

characterised in that the palpable structures are formed by active actuators.

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 01 9878

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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08-04-2004

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